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## Awareness and level of knowledge of interventional radiology among clinical year's medical students at Tabuk University

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**ABSTRACT**

**Background:** Interventional radiology (IR) is a comprehensive specialty that covers a wide variety of image guided minimally invasive diagnostic and therapeutic procedures. Although IR is constantly growing, many people are misinformed regarding the responsibilities of IRs in clinical settings. This study aimed to see the awareness and knowledge among clinical year's medical students at Tabuk University regarding interventional radiology. **Methodology:** A cross sectional, self-administered questionnaire study. Our target population was the clinical year's medical students at Tabuk university. Ethical approval was obtained from the ethical committees of the University of Tabuk. **Results:** More than half of the participants said that they have an adequate and good knowledge about IR. And (53%) did not think that interventional radiologists have outpatient clinics or even do ward rounds in the hospital (51%). Also, 70% did not believe that they treat patients at all. And 55% believed that interventional radiologists must finish training in Surgery and Radiology, while 30% only correctly identified radiology as a method of training. Regarding the procedures done by interventional radiologists they were familiar to the majority of the participants. **Conclusion:** The results of this study suggest that the awareness of IR among senior medical students in Tabuk and Saudi Arabia are higher than other countries. However, there are still low career considerations for IR due to lack of interest. This can be addressed by increasing the IR exposure in medical school through improving the curriculum related to IR increasing IR trainings.

**Keywords:** Interventional Radiology, Awareness, medical students, Knowledge, Tabuk

## 1. INTRODUCTION

Interventional radiology (IR) is a comprehensive specialty that covers a wide variety of image guided minimally invasive diagnostic and therapeutic procedures. Neuroradiology, pediatric radiology, IR and a number of other sub specialties are within the diagnostic radiology umbrella. The American Board of Medical Specialties recognized IR as a specialty in 2012 and a residency program was established. Despite the fact that the area of interventional radiology (IR) is constantly growing, many people are misinformed regarding the responsibilities of IRs in clinical settings.

Medical students have had limited exposure to the IR specialty during their education and there is no official IR education in the undergraduate curriculum, for example, a 313-student survey in Spain found that medical students had limited awareness of IR (de Gregorio et al., 2018). We found several publications on Saudi medical students, one of which was a big study from Riyadh, Hail and Jeddah, all of which revealed insufficient exposure or knowledge to interventional radiology (Albaqawi et al., 2019; Alnajjar et al., 2019; Abohmed et al., 2020).

A study conducted to assess the understanding knowledge and perceptions among undergraduates in the UK shows that the under graduate program does not provide sufficient exposure to IR for learners. As a result, during the clinical years, there is no improvement in understanding of IR clinical practice (Muzumdar et al., 2019).

A Canadian survey was done to evaluate medical students' exposure and knowledge towards interventional radiology (IR) and they concluded that there's insufficient exposure and knowledge towards Interventional radiology in medical college. And just 18% (19/103) of participants said that they would think of IR specialty, while 53% (55/103) claimed they had "poor" grasp of IR. The major reasons why respondents would not pursue IR as a career were a lack of understanding (48 percent, 37/77) and a lack of passion (43 percent, 33/77). Although 92 percent (95/103) of those surveyed were able to identify at least one IR procedure many (54 percent, 56/103) were unsure of an interventional radiologist's responsibilities inside the hospital. A required 14 days of radiology rotation during clerk ship would advantageous to 74% of students (76/103), according to the survey. Whereas 71% (73/103) said they'd want to do a 2-week IR selected rotation during their required core surgical rotation (O'Malley & Athreya, 2012). Other survey of interest in clinical and pre-clinical courses and knowledge of IR in Spanish medical students shows that they have a limited understanding of IR (de Gregorio et al., 2018).

In our country a Previous study was conducted to all medical students in their last year at Riyadh's university based medical schools, A total of 719 Senior medical students responded to the questionnaire, which was distributed to 822 students (87.5 percent). During November and December 2018, the majority of respondents said their awareness of IR was inadequate (83 percent), while a minority said they have a proper amount of knowledge (16 percent). Half of those who respond feel that interventional radiologists (IRs) need to complete their training in radiology. However, 42% believed that radiology and surgery were the best routes for IRs to choose for their training (Abohmed et al., 2020).

A study was conducted to evaluate the awareness of IR and determine the difference between the clerkship and pre clerkship years in February 2018 at King Abdulaziz University, Jeddah, Saudi Arabia. A total of 542 medical students were enrolled in the study Medical students' understanding and exposure to IR in the under graduate curriculum is insufficient, according to the study. \*A vast majority of respondents (n = 199, 36.7 percent) said they had little or no information about IR and 85 (15.7 percent) said they had no idea what it was. Only 87 students (16.1%) said they would consider pursuing a career path as radiologists. Lack of information was the most prevalent reason for not considering IR (42.9 percent). Under graduate in their clinical years were more interested in and exposed to IR than students in their pre clerkship years (73.0%, p = 0.001 and 55.7 percent, p = 0.030, respectively) (Alnajjar et al., 2019).

In 2021 a cross sectional study was done at Hail university on 244 clinical year medical students and 87 medical interns. They concluded that there was lack of knowledge among the majority of under graduate students about Interventional radiology. Those who were interested to take an elective rotation in IR were about one third of the respondents on the other hand more than 50% were unsure or not interested (Albaqawi et al., 2019).

Systematic review was done by searching in Pub Med and all Ovid databases and only 17 papers out of 6081 met the requirement for inclusion, with 15 of them focusing on interventional radiology. The paper found that the majority of the studies (9/17) were surveys with limited knowledge and motivation among students (Emin et al., 2019). We aimed to evaluate whether clinical years' medical students at Tabuk University are aware of interventional radiology and whether they are interested in it as a career option.

## 2. SUBJECTS AND METHODS

This is a cross sectional questionnaire research conducted to all clinical years' medical students at Tabuk university In Tabuk region, Saudi Arabia. A valid survey was utilized, which has previously been used in Saudi and Canadian publication, also the permission was obtained from Riyadh's publication to use the questionnaire in our research (O'Malley & Athreya, 2012; Albaqawi et al., 2019; Alnajjar et al., 2019; Abohmed et al., 2020). There are 21 closed and open-ended questions in total. The student's overall awareness and general understanding of IR tested by using Self-Administered Questionnaire. The questions included an assessment of their understanding of IR in comparison to other specialties, identify three IR procedures, whether they would be interested to pursue a career in the field and a series of "yes" and "no" questions on IR procedures. Also, they were asked about vertebroplasty, radio frequency ablation of tumors, percutaneous nephrostomy and image guided turn or biopsy and which of these interventions, they were most acquainted with. Also, we assessed what they believed the best path to IR was if they wanted to take an IR elective and what they thought about IR's future job prospects.

The sample size calculated by using raosoft web site and the sample size was 177 with 96.6% CI and 4.99% Margin of error. Our inclusion criteria were clinical year's medical students from the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> years. All the basic years' students excluded from this study. All clinical year's students received the questionnaire either as a written form or an online one, the consent to participate in the research was included in the survey after full explanation and there's no private information given and all the participants answered anonymously.

Data entered in Microsoft excel sheet and uploaded into SPSS software. All data have been entered on data sheet then analyzed electronically on SPSS. Categorical variables described as frequencies and percentages. Chi square test, independent t-test and ANOVA test utilized accordingly. A p-value of <0.05 declared significant. The results were discussed and analyzed by a Biostatistician. An ethical approval is granted by the Medical Ethics Committee of Tabuk university (UT-219-71-2022, dated 2022-06-23). The study started at august 2021 and ended at September 2022.

## 3. RESULTS

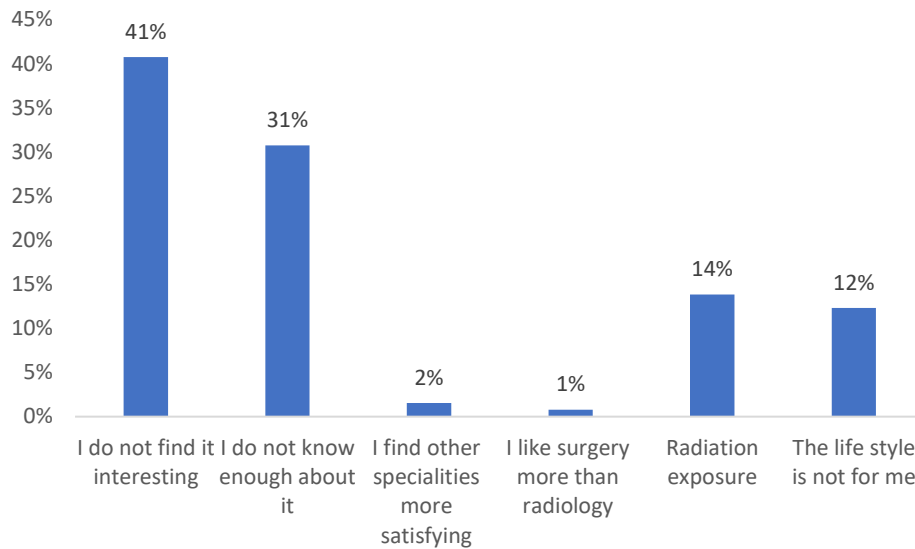
The respondent distribution according to the gender & academic year demonstrated in table 1 & 2 respectively. Seventy one percent of respondents said they had adequate or good understanding of radiology in general. And those who assessed their knowledge base to be poor were 14% and 13% respectively, while around 1% felt that they don't have any knowledge regarding radiology in general. For Interventional Radiology (IR), 33% of respondents rated their general awareness IR as adequate. Those who rated their knowledge of IR to be excellent, good and poor were 15%, 23% and 24% respectively, while 5% stated that they don't have any knowledge regarding interventional radiology. While the majority of respondents (79%) either didn't finish didn't intend to finish nor weren't certain regarding taking an elective rotation in Radiology, just 21% of participants either finished or intend to finish an elective rotation in Radiology. About a quarter of respondent (23%) would think of Diagnostic Radiology (DR) while 27% were willing to think of IR as a career option. The main reasons of respondents not thinking about a profession in IR are summarized and shown in Figure 1, with lack of interest being the leading reason (41%).

**Table 1** sample dissemination based on the gender

Gender	Number & Percentage
Males	75 (42 %)
Females	102 (57%)
Total	177

**Table 2** sample dissemination based on the academic year

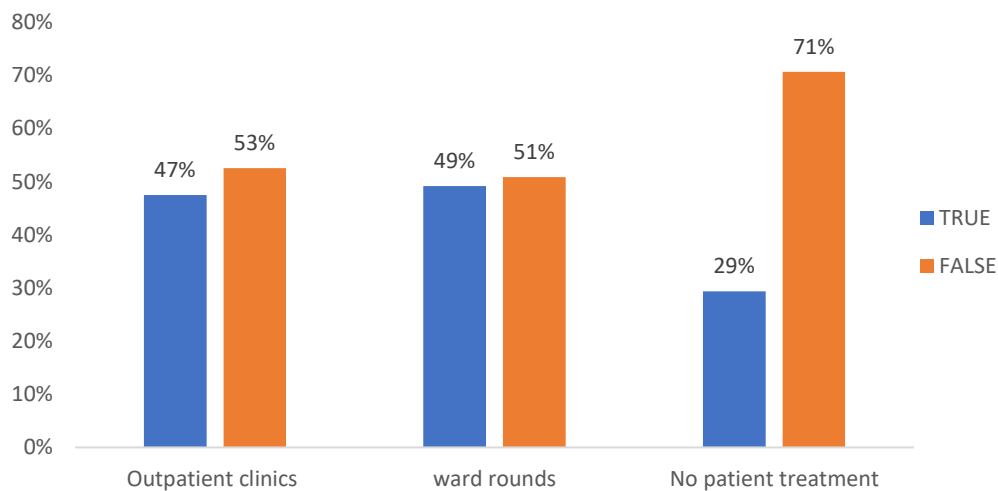
Academic year	Percentage
4 <sup>th</sup> year	25%
5 <sup>th</sup> year	38%
6 <sup>th</sup> year	37%



**Figure 1** reason not to think of becoming an interventional radiologist

63% of those surveyed said they had never seen a patient who had been managed by an interventional radiologist. When the respondents asked to list 3 interventional radiology procedures they already know, most of the answers were CT, X-ray, MRI and angioplasty. Only 30% of respondents correctly identified radiology as a training path way for interventional radiologists and 55% believed that IR must finish both radiological and surgical training.

Figure 2 illustrates respondents' understanding of interventional radiologists' clinical practice. More than half of the participants (53%) did not know that Interventional radiologists have Outpatient clinics or do hospital ward rounds (51%). In addition, 29% said they did not think interventional radiologists ever treat patients.

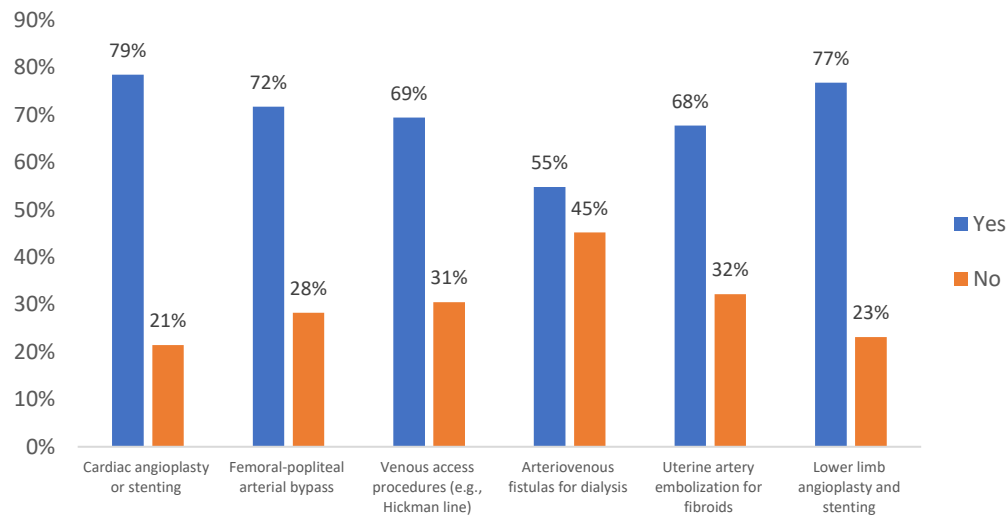


**Figure 2** Participants' understanding of interventional radiology clinical practice

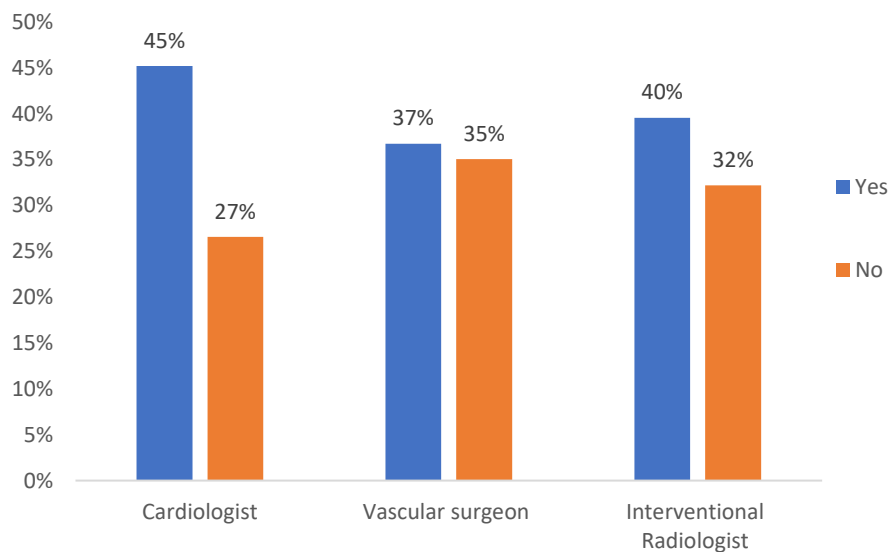
Most of the responders' information about IR came from self directed research (20%) and lectures from interventional radiologists (29%). Additional sources were multi-disciplinary meetings (2%), ward rounds (3%), problem based learning sessions (7%) and radiology elective rotation (16%). Meanwhile, 21% of respondents said they had no prior experience IR. The mandated radiology course during medical school was deemed favorable by 63% of the respondents, whereas 37% either disagreed or were unsure. We asked if they would consider taking a 14 days IR rotation during the internship's 3 month surgery rotation and 55% of respondents said yes.

Figure 3 presents an overview of the respondents' understanding of the different types of operations carried out by interventional radiologists. Most responders (79%) thought interventional radiologists do cardiac angioplasty (79%) and lower limb angioplasty (74%), the knowledge of the respondents was also assessed and it was found that the majority of respondents (57%) were not familiar with vertebroplasty. However, the majority were aware of percutaneous nephrostomy (51%), endovascular repair of an aortic aneurysm (59%), radio frequency ablation of tumors (53%) and image guided tumor biopsy (72%). The angioplasty procedure was known to 72% of the respondents.

The source of exposure to angioplasty and gaining knowledge by respondents was 45% from cardiology, 40% from IR, and 37% from vascular surgery, as shown in Figure 4.



**Figure 3** Respondents' knowledge of the types of procedures performed by interventional radiologists.



**Figure 4** Respondents' source of knowledge of angioplasty

The majority of respondents about one third felt that interventional radiologists had decent career prospects, whereas 28% and 20% felt that they are either acceptable or great, respectively. 8% of participants said that the career futures are poor and 11% did not have any knowledge regarding the career prospects of IR.

#### 4. DISCUSSION

Interventional radiology (IR) is a comprehensive specialty that is expanding rapidly however it still faces multiple numbers of challenges including lack of knowledge and awareness there are a limited, yet growing, number of literature published regarding IR in Saudi Arabia. Medical students play a major and essential part in developing interventional radiology's future. Therefore, it is important to study and understand the knowledge and awareness of it among Saudi medical students and compare it to the published literature in other countries. In order to obtain that understanding, the survey used in this research was created and conducted in a similar manner to surveys implemented in Canada, Europe, USA and Saudi Arabia (O'Malley & Athreya, 2012; de Gregorio et al., 2018; Albaqawi et al., 2019; Alnajjar et al., 2019; Abohmed et al., 2020).

In this study 33% and 23% of participants assessed their knowledge of IR as adequate and good, respectively. While in the Canadian study 55% of respondents stated that they have a poor knowledge in IR (O'Malley & Athreya, 2012). Also, a Spanish study conducted and showed that most medical students have limited understanding of IR (de Gregorio et al., 2018). Additionally, a British study conducted to assess the understanding and knowledge of under graduate students showed that schools and programs do not provide sufficient exposure to IR which led to lack of knowledge and understanding of IR (Muzumdar et al., 2019). Other Saudi studies stated that most of the under graduate medical students have inadequate level of knowledge in regard to IR (Albaqawi et al., 2019; Alnajjar et al., 2019; Abohmed et al., 2020) and lack fundamental understanding of IR (Albaqawi et al., 2019).

Twenty seven percent of respondents in this survey stated that they are would think of IR and lack of interest being the leading reason for not considering it (41%). That percentage is higher than the Canadian survey that showed that only 18% of respondents are thinking of IR in the future as a career option, with lack of understating being the leading reason for not considering it (48%). (O'Malley & Athreya, 2012) In another Saudi survey conducted in Jeddah, only 16% of respondents showed an interest in choosing IR as career choice in the future, with the lack of information being the main reason for not considering it (43%). (Alnajjar et al., 2019) This study showed that most of respondents did not think interventional radiologists have outpatient clinics (53%) or do ward rounds in the hospital (51%). Also, 71% did not believe that interventional radiologists treat patients at all. The study conducted in Canada also showed that 54% of respondents were unsure of responsibilities of interventional radiologists in hospitals (O'Malley & Athreya, 2012).

A Saudi study conducted in 2018 proved that medical students in their clerkship years were more interested in IR than their peers in their pre clerkship years (Alnajjar et al., 2019). In this study, 55% of respondents were interested in taking a 2 week IR during internship. The Canadian study stated that 74% of respondents believed that during the clerkship, a two week radiology rotation might be useful. And 71% stated that a 2 week rotation in IR during surgical rotation would be advantageous (O'Malley & Athreya, 2012). However, a Saudi study conducted in 2021 stated that over 50% of respondents were either not interested or uncertain about performing their elective in IR (Albaqawi et al., 2019). Never the less, this study showed that only 16% of respondent gained knowledge about IR through radiology elective rotation.

Although radiology is the correct pathway for IR training, only 30% of respondents in this study were able to know that. On the other hand, this survey showed that over half of participants believed that interventional radiologists must finish training in both surgical and radiological training. While another Saudi study showed that 42% of respondents believed this idea about IR (Abohmed et al., 2020).

There are still some limitations in this study. First, the data were collected from one university in one region in Saudi Arabia due to time and resource constrains, which limited the sample size. Larger sample size collected throughout the country might be required for a more accurate and generalized results. Another limitation might be the response bias. Meaning that respondents interested in interventional radiology will answer more than those who are not interested which might affect the response rate.

#### 5. CONCLUSION

To conclude, the findings of this study indicate that the awareness and knowledge of IR among senior medical students in Saudi Arabia are higher than other countries. However, there are still low career considerations for IR due to lack of interest. This can be addressed by increasing the IR exposure in medical school through improving the curriculum related to IR increasing IR trainings.

### List of Abbreviations

IR: interventional radiology

DR: Diagnostic radiology

### Acknowledgement

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### Ethical approval

The study was approved by the Medical Ethics Committee of Tabuk university (UT-219-71-2022, dated 2022-06-23).

### Authors' contribution

All the authors contributed in the manuscript writing and the data collection equally.

### Funding

This study has not received any external funding.

### Conflict of interest

The authors declare that there is no conflict of interests.

### Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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